

Case Study

Innovative engineering and stabilisation at Structure 'C' Bray Head, County Wicklow



“... The drill drains are one of the key aspects to this project ...”

In Partnership With:



Customer Name: Triur Construction
Project Name: Bray Head Structure C
Project Location: County Wicklow, Republic Of Ireland

Project Challenges and Background

Bray Head is situated in County Wicklow, south of Dublin in the Republic of Ireland. The route around the headland was surveyed and engineered by none other than Isambard Kingdom Brunel, who at the time was engaged with the construction of the Dublin & Wicklow Railway's line from Bray to the county town of Wicklow further south. The section of line around the headland from Bray to Greystones was first opened in 1855.

The works were located at coastal defence asset CDR074D (also known locally as 'Structure C') situated at 13 miles, 1,225 yards on the Dublin to Wexford railway line. In more specific terms, this asset is located on Bray Head on the railway line between Bray and Greystones in Co. Wicklow within a SAC area. This project was designed to replace a gabion structure that was installed in 1970 in which movement had been evident for some years but had accelerated in recent years.

The structure had been monitored closely and using Geotechnical inspections it was determined that the structure was settling due to the movement of water flowing through a steep ravine cut in the rock below.

From a logistical perspective this site was extremely difficult to service, and it required detailed planning to ensure that all plant and personnel could be transported to site safely. Any drainage or drilling operations had to be done precisely and due to difficult and restrictive access small manageable plant and equipment had to be lowered down the slope to enable the works to commence.

The track area was piled with vertical micropiles at close centres to bridge the gap across the ravine. These micropiles were used to stiffen the track support zone over a length of 20m with a geogrid installed in the ballast sub-base to support the permanent works.



Ground Conditions

The published geological maps of the area indicate that the solid geology consists primarily of the Bray Head Formation; greywacke and quartzite.

Generally, bedrock outcrops and bedrock at or near the surface is predominant in the local area, with very shallow superficial geology consisting of soils derived from non-calcareous rocks and gravels with a peaty surface horizon.

Geology	Sea Defence Wall	Gabion Retaining Structure	Soil Embankment	Rock Cliff
Soil Type	Marine sands and gravels	Fill / Topsoil overlying rock	Fill overlying rock	None present
Rock Type	Bray Head Formation	Bray Head Formation	Bray Head Formation	Bray Head Formation

Products Used

Ischebeck Titan 40/16 duplex coated self-drilling hollow bars were installed in two areas on this project. Also, the unique Drill Drain® hollow bars were also installed at the toe of one structure enabling drainage of any build-up of water pressure.

DUPLEX COATING: Ischebeck Titan duplex coated hollow bars are hot-dipped galvanised to DIN EN ISO 1461 with an additional powder coating for corrosivity.



The Titan hollow bars were used to reinforce the gabion buttress structure with a precast concrete modular block wall, anchored with vertical and raked micropiles. There were also inclined Drill Drain® hollow bars inserted to provide drainage of the ground water flowing through the ravine.

DRILL DRAIN® is a directly drilled drain (inclination of $\geq 10^\circ$), reinforced with a hollow bar tendon from Ischebeck Titan. The filter material (water mixed grout used to encapsulate the bar) is pressure injected into the holes enabling the excess water to be drained away via the filter material when set, this way reducing any increased pore water pressure.

Additional Support and Services

Ischebeck Titan UK supported the designers Irish Rail and contractor Triur CE with a series of specifications and data to help with the design of the Drill Drain® and TITAN Micropiles. This included current up to date data sheets, literature, product availability and carefully co-ordinated logistics, including additional information relating to the components of the TITAN solution.

The contractor was also given additional support on site and a training day in Ireland on the procedure and correct guidance to install the Drill Drain® by a technician from the parent company in Germany. This included the Drill Drain® mixing for the filter material grout that had to be mixed with specific instructions.

Delivering product and equipment from both the UK and Germany, logistically, due to the nature of this project with track and line possession, it was critical that deliveries were on time and every effort was made to ensure that all components and equipment were correct to avoid any delays.



The Result

The benefits of using Ischebeck Titan self-drilled hollow bars were the control, accuracy and speed to complete the project on schedule. Various piling techniques were discussed to stabilise the embankment and structures, but due to the restrictive working room and the loadings required for each bar, the anchors had to be installed with specialist lightweight drilling equipment.

The Drill Drain® solution from Ischebeck Titan was installed to take away any water cascading down through and into the ravine and then through the rock structure. From the first day of installation the drilled drains were immediately effective and operational.

Customer Testimonial

“The drill drains are one of the key aspects to this project. We hope that they operate efficiently and that they help to remove ground water from the ravine. Speed and versatility. Access was so difficult; we were limited to construction plant and the crane pictured could lift that rig at that distance to commence the drilling operation.”

Stephen Bateson, Design Engineer, Irish Rail

Find out more...

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